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Research Article

Phytochemical Screening and Anti-Diabetic and Anti-Hyperlipidemic Activity of Ethanolic Fruits Extract of *Scindapsus Officinalis* (Roxb)

Pawan Tiwari *, Anju Goyal

Department of Pharmaceutical Chemistry, Bhupal Nobel University, Udaipur, Rajasthan, India.

ABSTRACT

The present research work emphasized on evaluates the Phytochemical & Pharmacological activities of the fruits of *Scindapsus Officinalis* (Roxb) (*Araceae*). The fruits of the plant were shade dried, reduced to coarse powder with the help of grinder was subjected to successive soxhlet extraction with Petroleum Ether and 90% v/v Ethanol (Emparta). The various extracts were then subjected to preliminary phytochemical screening which revealed the presence of flavonoids, saponins, tannins, phenols, carbohydrate, lipids, alkaloids & steroids. Selection of active extract for *in vivo* studies was based on preliminary phytochemical tests and *in vitro* glucose diffusion inhibition potential and accordingly, ethanolic extracts were chosen for further studies. The pharmacological screening included evaluation of the antidiabetic and hypolipidemic activity of ethanolic extracts (200mg/kg and 400mg/kg b.w) on Streptozotocin-induced diabetic rats. The ethanolic extract was found to be more effective and brought about significant antidiabetic & hypolipidemic potential. This was due to the presence of one or more phytoconstituents present in ethanol extract.

Keywords: *Scindapsus Officinalis* (Roxb); Antidiabetic; Anti-hyperlipidemic; Streptozotocin.

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*Address for Correspondence:

Pawan Tiwari, Research Scholar, Department of Pharmaceutical Chemistry, Bhupal Nobel University, Udaipur, Rajasthan, India.

INTRODUCTION:

The occurrence of diabetes is hastily rising all over the world at a frightening rate. Over the past 30 years, the status of diabetes has changed from being measured as a kind disorder of the old to one of the main causes of morbidity and mortality disturbing the childhood and middle aged people. It is essential to note that the increase in prevalence is seen in all six populated continents of the globe.[1] Diabetes is deadly disease in both developed and developing countries. In 2000, there were a probable 175 million people with diabetes universal and by 2030, the projected estimate of diabetes is 354 million.

S. officinalis is a communal plant in tropical forests of many parts of India, Myanmar, China and Nepal. In India, the plant is cultivated for its fruits at Midnapur, Bengal and is originate in southern cities of Calicut and Cochin. It is also existing in Rosa thicket in managed sal (*Shorea robusta* Gaertn.) forests of Gorakhpur region.[2,3].

MATERIALS AND METHOD:

Collection and identification

Plant was collected from the India, during the months of august and September 2017. Taxonomic and ethno medicinal identification of the collected fruits of plant by Mr. S.L. Meena (Deputy Director of botanical survey of india, near khem ka kuaon, Nandan Van, Jodhpur-324008)

Preparation of plant material

The fruits of plant were shade dried, reduced to coarse powder with the help of grinder and stored in airtight container till further use. 1 kg of powdered drugs were packed in soxhlet apparatus and continuously extracted with petroleum ether to defat the fruits powder. Petroleum ether was removed from the powdered defatted drug, which was then extracted with ethanol (90%). The extracted were evaluated for anti-diabetic activity, then most bio potent extract further fractioned with hexane, chloroform and ethanol. The solvents were removed from each extract and fraction by distillation and the last traces of solvent being removed under reduced pressure. The extracts and fractions

were weighed and their % value was recorded and also the physical appearance, color and odor was evaluated and recorded and thereafter, extracts were stored in refrigerator for further experimental work [4-7].

Quantitative determination of the chemical constituents:

Total phenols Determination:

The total content of phenols in the crude ethanol extract was determined using a modified Folin-Ciocalteu colorimetric method with Gallic acid as a standard. The extract solution in DMSO (700 μ L) was transferred to a 10 mL volumetric flask, the Folin-Ciocalteu reagent (400 μ L) was added and after 3 min, each flask was made up to the mark with sodium carbonate (Na_2CO_3) solution (75 g/L). After 2 hours, the suspension was centrifuged (5000 r.p.m., 5 min) and the absorbance of the solution was measured at 760 nm. The total phenolic content was expressed as a Gallic acid equivalent (GAE) in g/100 g of dry extract. Data are reported as mean $\pm$ SD for three replicates. The total phenol was calculated.[8]

Total alkaloid determination

5 g of the sample was weighed and transfer into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol [9] was added and covered and allowed to stand for 4 h. This was filtered and the extract was concentrated on a waterbath to one-quarter of the original volume. Concentrated ammonium hydroxide was added drop wise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitated was collected and washed with dilute ammonium hydroxide and then filtered. The residue is the alkaloid, which was dried and weighed. The total alkaloid was calculated.[10]

Total tannin determination

500 mg of the sample was weighed into a 50 ml plastic bottle. 50 ml of distilled water was added and shaken for 1 h in a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the mark. Then 5 ml of the filtered was pipetted out into a test tube and mixed with 2 ml of 0.1 M Ferric chloride in 0.1 N HCl and 0.008 M potassium ferrocyanide. The absorbance was measured at 120 nm within 10 min. The total tannin was calculated.[11]

Total flavonoid determination

10 g of the plant sample was extracted repeatedly with 100 ml of 80% aqueous methanol at room temperature. The whole solution was filtered through whatman filter paper No 42 (125 mm). The filtrate was later transferred into a crucible and evaporated into dryness over a water bath and weighed to a constant weight. [12]

Thin layer chromatography (TLC)

Chromatography is widely used for the separation, isolation, identification, and quantification of components in a mixture.

Preparation of plates

Slurry of silica gel G and distilled water was prepared in a pestle with continuous triturating with mortar. The slurry was spread evenly on clean grease free glass plates. The plates were dried in air and thereafter heated in oven at 110 $^{\circ}\text{C}$ for about 30 minutes to activate them.[13]

Preparation of samples

Approximately 10 mg of material was dissolved in respective solvents and was used for spotting on TLC plates. The TLC profile was examined to determine variation in band size and color intensity between the Ethanolic extract and its two fraction .The observation indicate that variations are present amongst Ethanolic extract, Ethanolic fraction, Hexane fraction and chloroform fraction. The TLC study was done by using different solvent system for each fraction separately and the compounds were detected by sun light, in iodine vapours, vanillin sulfuric acid reagent and long UV.[14-18]

Determination of the antidiabetic effect of the *scindapsusofficinalis* in rats

Drugs and Chemicals

Scindapsus officinalis and streptozotocin were purchased from Sigma-Aldrich. Glucose kits were purchased from Agappe Diagnostics Ltd., India. All other chemicals were obtained from Hi Media (Mumbai, India) and SD Fine Chemicals Limited (Mumbai, India).

Experimental Induction of Diabetes

Diabetes was induced in rats with an intraperitoneal injection of STZ ((40 mg/kg bwt) freshly prepared in 0.1 M sodium citrate buffer (PH 7) after overnight fasting. The rats exhibited diabetes after 5 days (i.e., fasting blood glucose concentration, >300 mg/dl) and were selected for the treatment with *Scindapsus officinalis*. dissolved in water. [19]

Sample Collection

Blood samples were collected from orbital plexus by pricking a needle under ketamine anesthesia. Rats had free access to water and food while in metabolic cages. The change in body weight of the rats was recorded at regular intervals throughout the study. At the end of the experiment, all the animals were starved for 16 h and anaesthetized by intra-peritoneal injection of ketamine (30mg/kg body weight) and sacrificed by cervical decapitation. Blood samples were collected and the tissue was removed immediately, washed with ice-cold physiological saline to remove the blood clot and other tissue materials. For histopathological studies, a piece of 1 cm³ of tissue was cut and placed immediately in phosphate buffered formal saline pH 7.4[20]

Separation of Serum

The blood sample collected by centrifuge tubes method in small vials in the freezer for the purpose of biochemical investigations.

Observations

Following observations carried out during the study period will be reported. Additional observations/parameters may be evaluated based on need at the discretion of study director and will be documented accordingly viz; Morbidity and Mortality Observations, Clinical Observations, Body Weight: Body weights will be recorded on the day 1 of acclimatization and on the day of randomization; on Day 1 (prior to dosing of STZ) and 5th day after STZ induction on Days 7, 14, 21, 28 and 29 (fasting condition) during the experimental period.

Gross Pathology

At the end of the observation period, all animals will be euthanized by chloroform asphyxiation followed by exsanguination and subjected to gross necropsy, including examination of external surfaces, orifices and thoracic/abdominal cavities.

Biochemical Studies

Estimation of Blood Glucose

Glucose was estimated by the method of Trinder (1969) using reagent kit. A 10 µl of serum, standard and distilled water (blank) were taken in three separate tubes. One ml of the enzyme reagent was added, mixed and kept at 37°C for 15 min. The colour development was read at 510 nm against a reagent blank in a UV-Visible spectrophotometer. The values are expressed as mg/dl.[21]

Antihyperglycemic activity of ethanolic extracts in glucose-loaded animals (oral glucose tolerance test)

The oral glucose tolerance test (OGTT) measures the body's ability to use main source of energy i.e. glucose. OGTT is to simplify and facilitate the diagnosis of diabetes (Luzi, 1998). This method is frequently referred to as physiological induction of diabetes mellitus because the blood glucose level of the animal is fleetingly increased with no damage to the pancreas. An oral glucose tolerance test (OGTT) was performed on diabetic rats by feeding glucose (5 g/kg) per os. Animals were deprived of food 18 h before and during the experiment, but were allowed free access to water. They were divided into 5 groups of 6 rats each. Group I served as normal control, Group II served as solvent control and received only vehicle (Tween + water - 2 ml/kg b.w.) through the oral route. Group III received glibenclamide (5 mg/kg b.w.). Groups IV to V received the alcohol extracts of *Scindapsus officinalis Roxb.* at a dose of 200 and 400 mg/kg b.w., respectively, through oral route. The blood glucose level was determined before drug and glucose administration (-1 and 0 h, respectively) and subsequently at 0.5, 1, 2 and 3h after.[22]

Effect of the ethanolic extracts on blood glucose level in streptozocin induce hyper glycemic rats

The acclimatized animals were kept fasting for 24 h with water *ad libitum* and injected intraperitoneally a dose of 150 mg/kg of streptozocin in normal saline. After 1 h, the animals were provided feed *ad libitum*. The blood glucose level was checked before streptozocin and 24 h after streptozocin as above. Animals were considered diabetic when the blood glucose level was raised beyond 200 mg/100 ml of blood. This condition was observed at the end of 72 h after streptozocin. The animals were segregated into five groups of six rats in each. Group I served as normal control, Group II served as diabetic control and received vehicle (2 ml/kg) through the oral route. Group III received glibenclamide (5 mg/kg). Groups IV to V ethanolic extracts of *Scindapsus officinalis Roxb.* at doses of 200 and 400 mg/kg. Blood glucose level of each rat was estimated at 1, 2, 4, 6, 8 and 10 h, respectively.[23]

Antihyperglycemic activity of ethanolic extract in glucose-loaded animals (oral glucose tolerance test)

An oral glucose tolerance test (OGTT) of ethanolic extract was performed on diabetic rats by administration of glucose (5 g/kg) per os. Animals were deprived of food 18 h before and during the experiment, but were allowed free access to water. They were divided into four groups of 6 rats each. Group I solvent control and received only vehicle (Tween + water - 2 ml/kg b.w.), Group II received standard drug glibenclamide (5 mg/kg b.w.). Groups III & IV received the ethanolic extract of *Scindapsus officinalis Roxb.* at a dose of 200 and 400 mg/kg b.w., respectively, through oral route. The blood glucose level was determined before drug and glucose administration (-1 and 0 h, respectively) and subsequently at 1, 2 and 3h after.[24]

RESULT AND DISCUSSION:

Table 1. Physical parameters of *Scindapsus officinalis Roxb.* Fruits powder

Studied parameters	Observation (% w/w)
Loss on drying	6.9
Total ash value	5.2
Acid insoluble ash value	4.3
Water soluble ash value	3.1
Alcohol extractive value	16.7
Water extractive value	6.7

Table 2. Phytochemical presents in extract *Scindapsus officinalis Roxb*

Test for	Ethanolic extract
Alkaloids	+
Carbohydrates	-
Glycosides	+
Phenols and tannins	+
Steroids	+
Terpenoids	+
Saponins	-
Flavonoid	+

(+) = present, (-) = absent

Table 3. Percentage of phytoconstituents present in *Scindapsus officinalis Roxb*

Constituents presents	Quantity of phytoconstituents in (%)
Alkaloids	10.32
Phenols	3.33
Flavonoids	8.32
Tannin	2.68

Table 4. Effect of Extract on animal for clinical observation

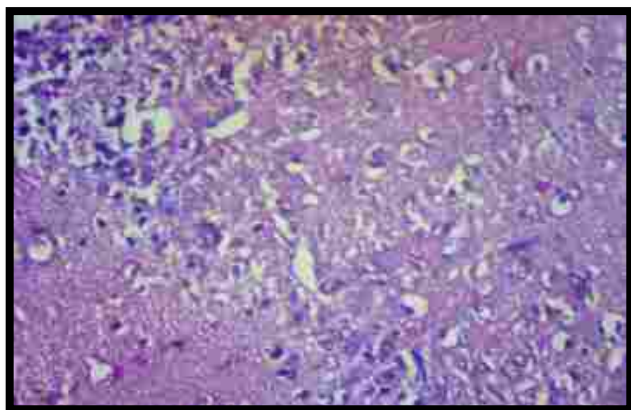
Sample Name	Extract <i>Scindapsus officinalis</i> Roxb												Species of Animal												Rat				
Standard	Glibenclamide												Gender of Animal												Wistar				
Animal ID	Days																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Group -1																													
GP1 - 1M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP1 - 2M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP1 - 3M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP1 - 4M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP1 - 5M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP1 - 6M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Group - 2																													
GP2 - 1M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP2 - 2M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP2 - 3M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP2 - 4M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP2 - 5M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP2 - 6M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Group - 3																													
GP3 - 1M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP3 - 2M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP3 - 3M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP3 - 4M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP3 - 5M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GP3 - 6M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 5 Effect of Extract on animal for clinical observation

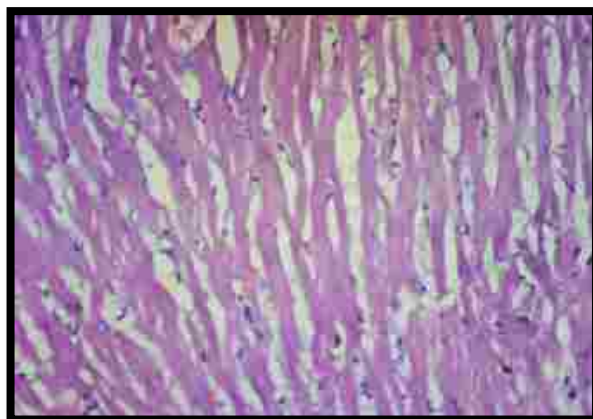
Sample Name	Scindapsus officinalis Roxb														Species of Animal														Rat			
Standard	Glibenclamide														Gender of Animal														Wistar			
Animal ID	Days																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29			
Group - 4																																
GP4 - 1M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP4 - 2M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP4 - 3M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP4 - 4M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP4 - 5M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP4 - 6M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Group -5																																
GP5 - 1M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP5 - 2M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP5 - 3M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP5 - 4M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP5 - 5M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP5 - 6M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Group - 6																																
GP6 - 1M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP6 - 2M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP6 - 3M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP6 - 4M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP6 - 5M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
GP6 - 6M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Histopathology

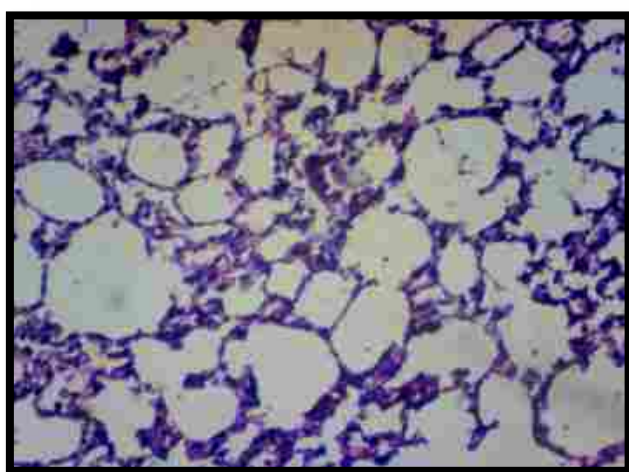
Group 1



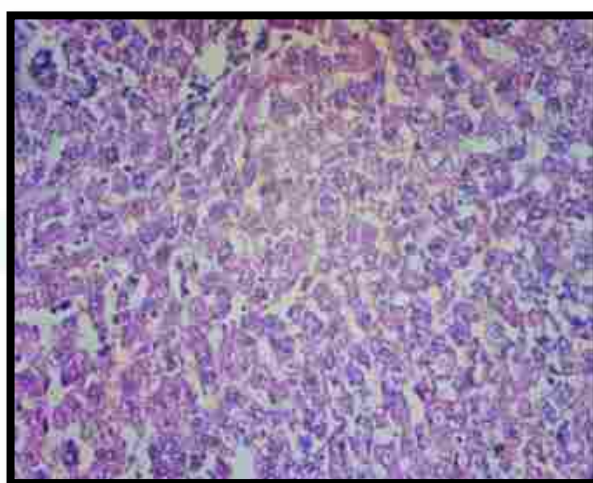
Brain



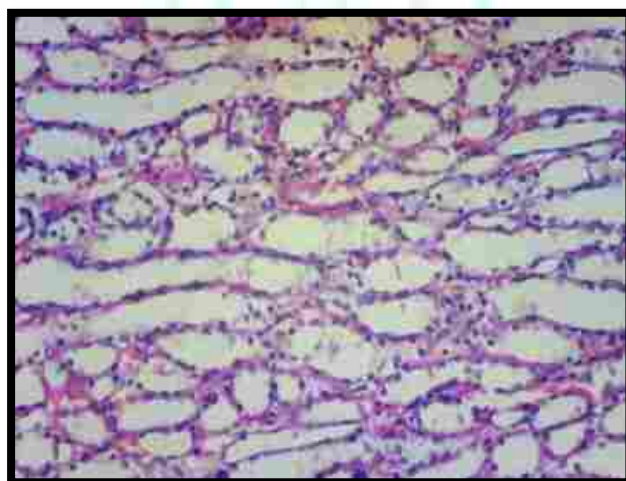
Heart



Lungs



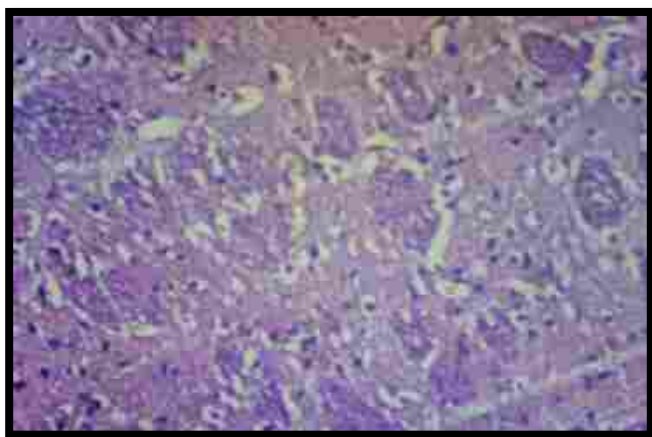
Liver



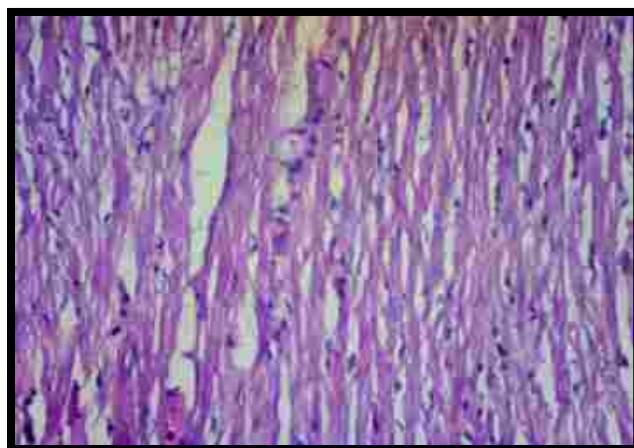
Kidney

Fig 1. Histopathology of group 1

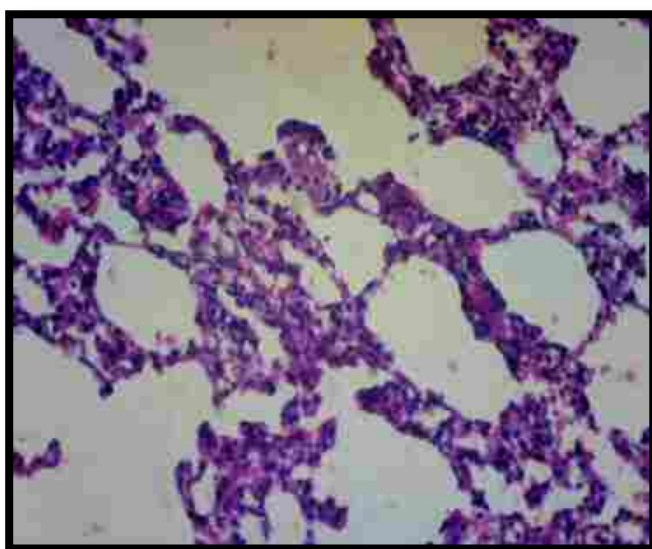
Group 2



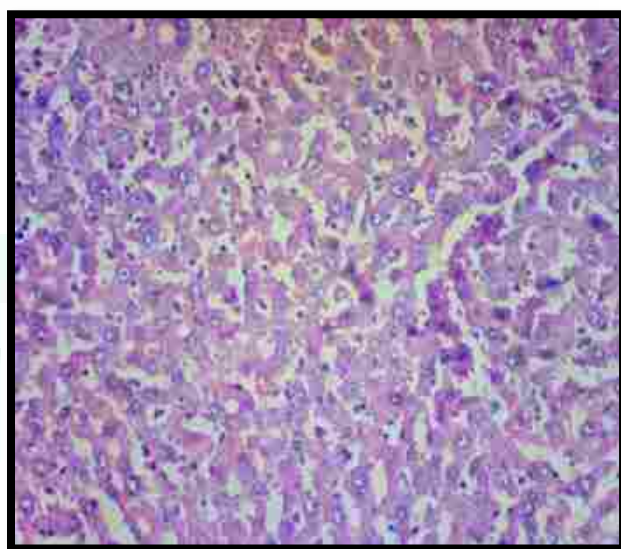
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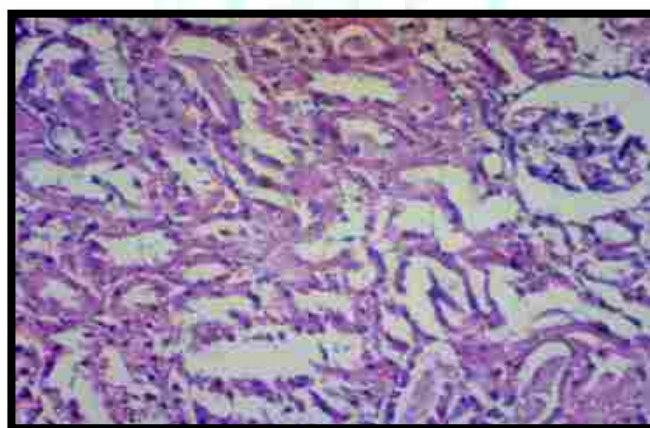
Heart



Lungs



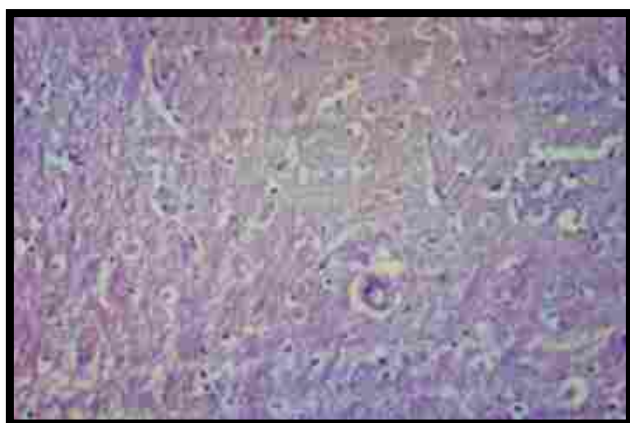
Liver



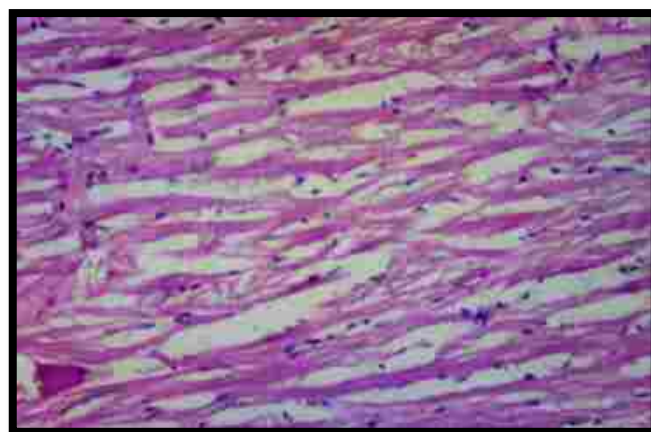
Kidney

Fig 2. Histopathology of group 2

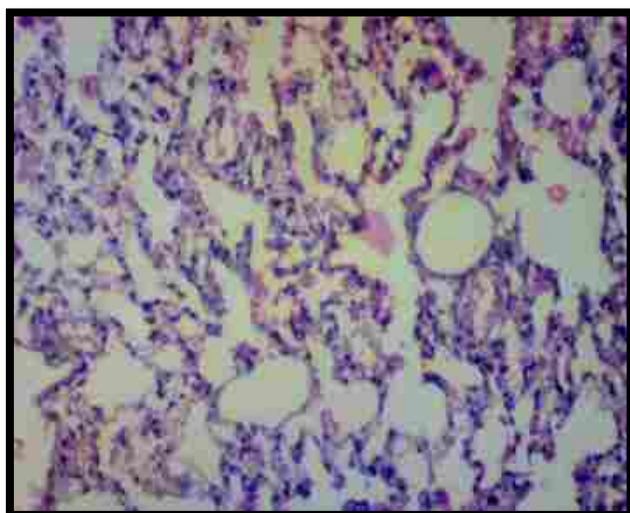
Group 3



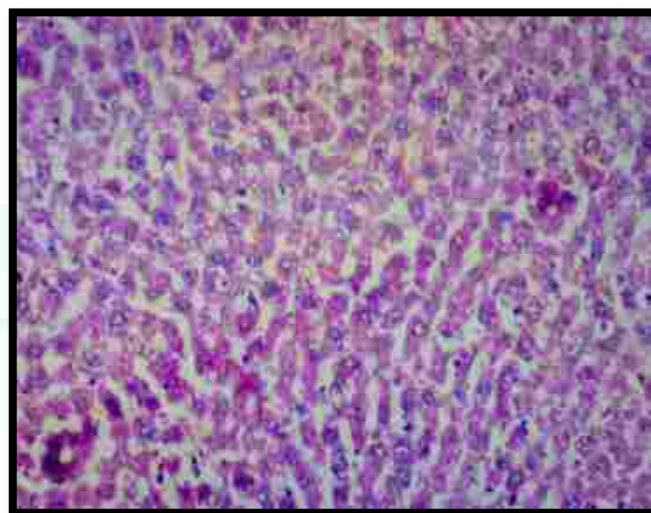
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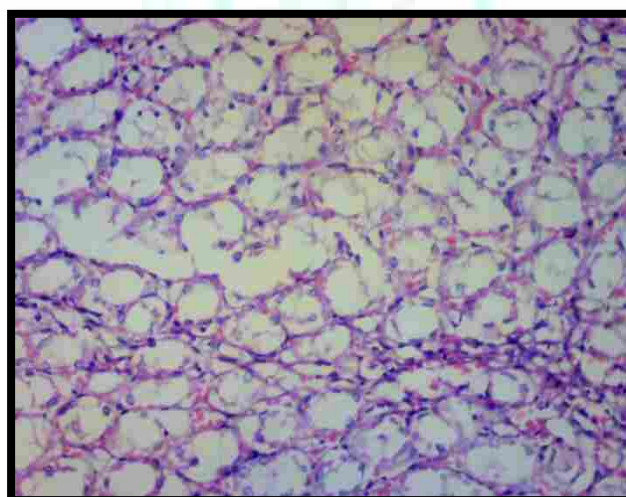
Heart



Lungs



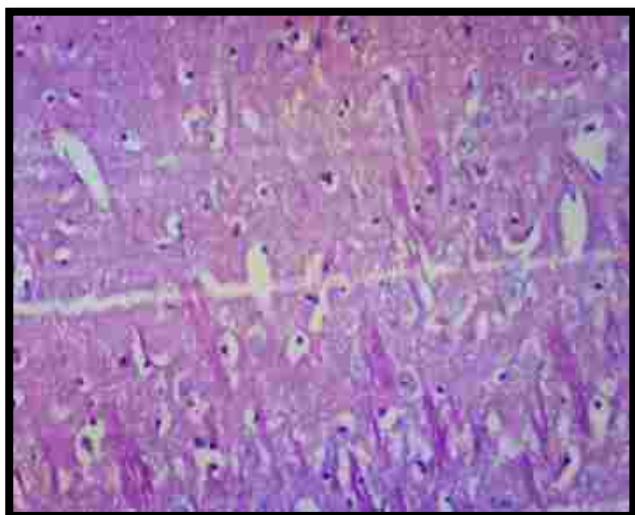
Liver



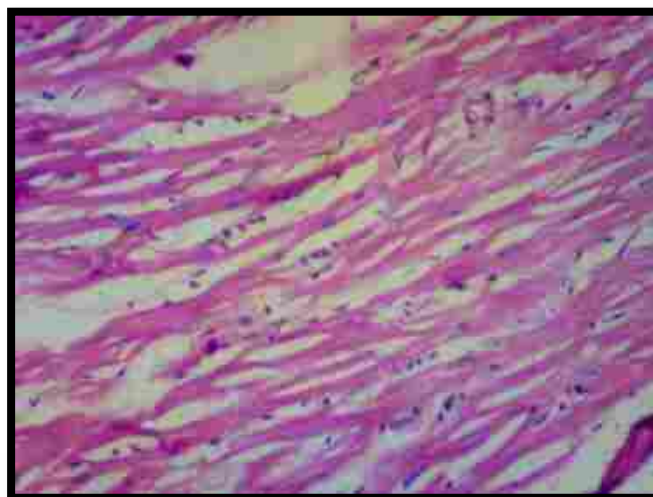
Kidney

Fig 3. Histopathology of group 3

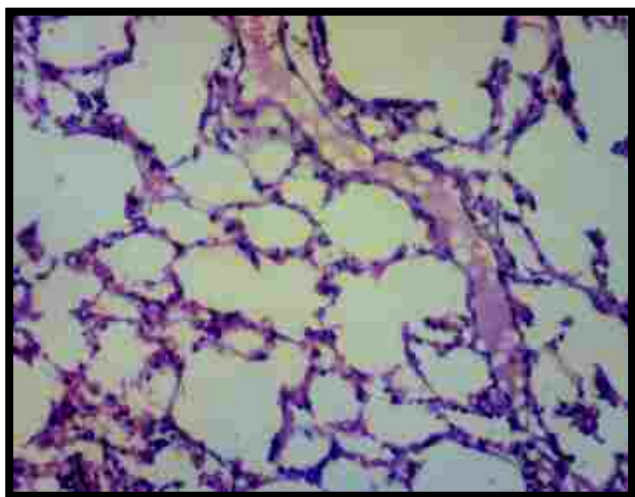
Group 4



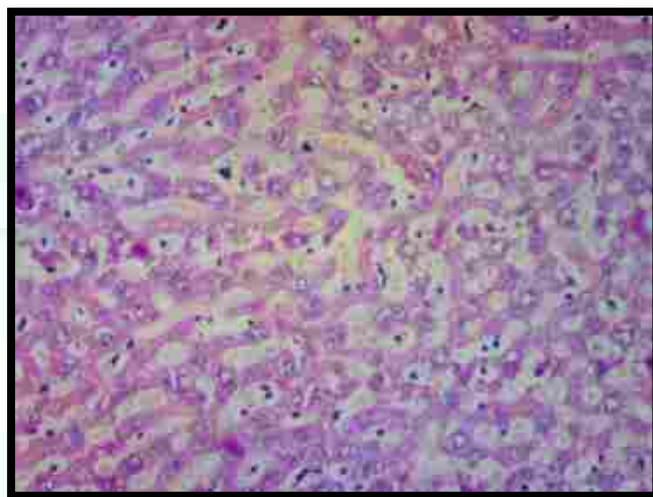
Brain



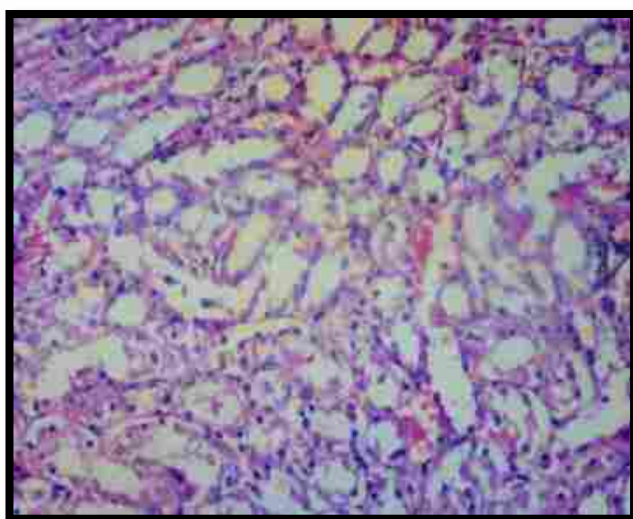
Heart



Lungs



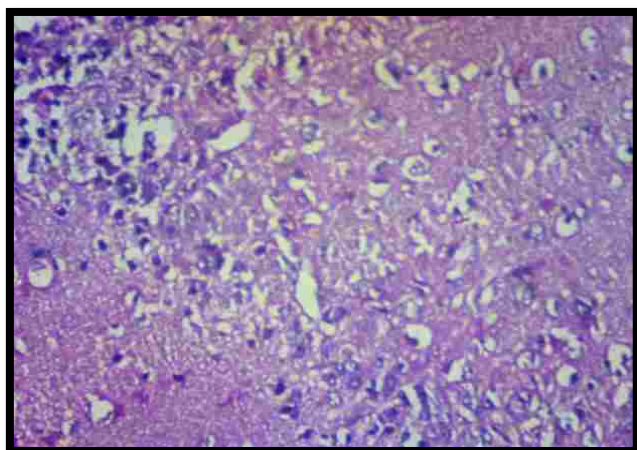
Liver



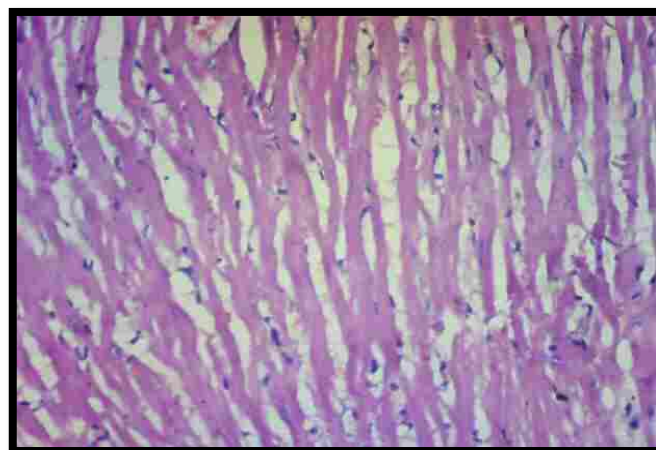
Kidney

Fig 4. Histopathology of group 4

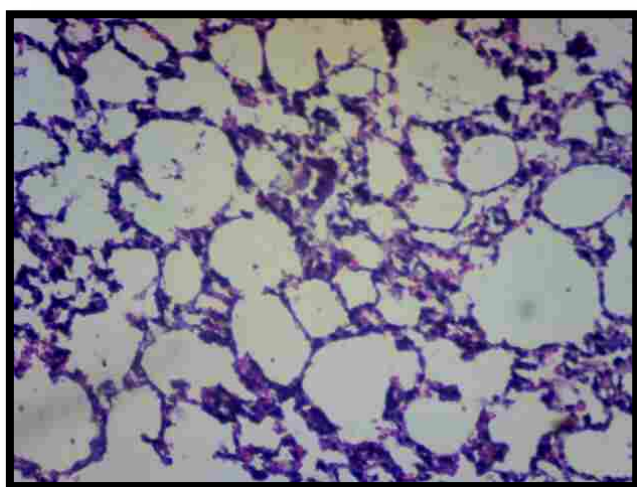
Group 5



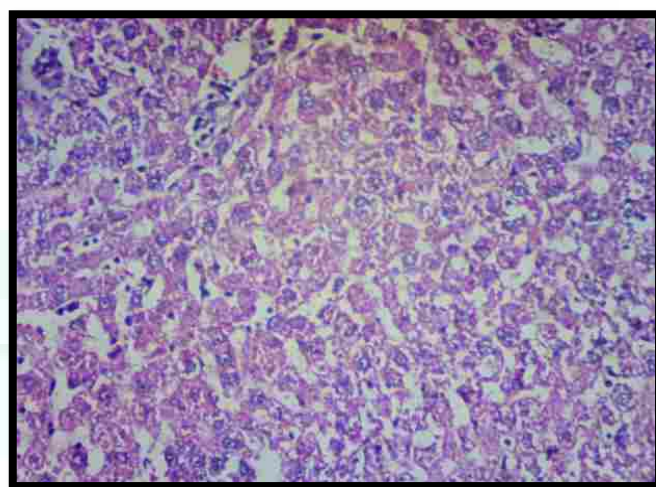
Brain



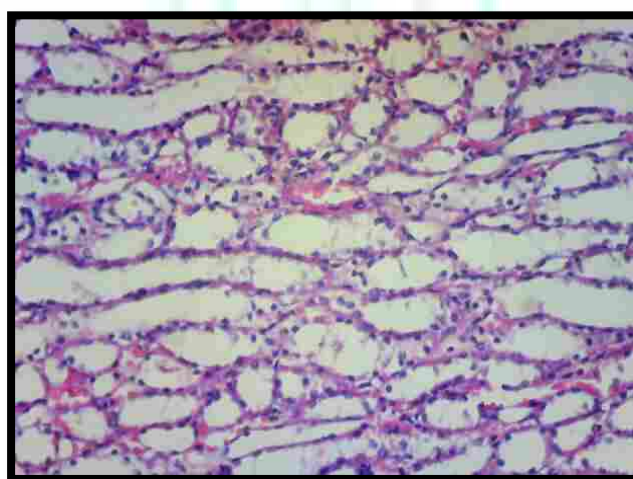
Heart



Lungs



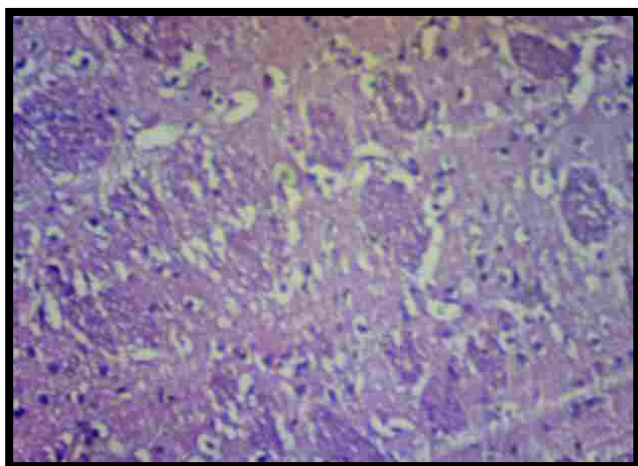
Liver



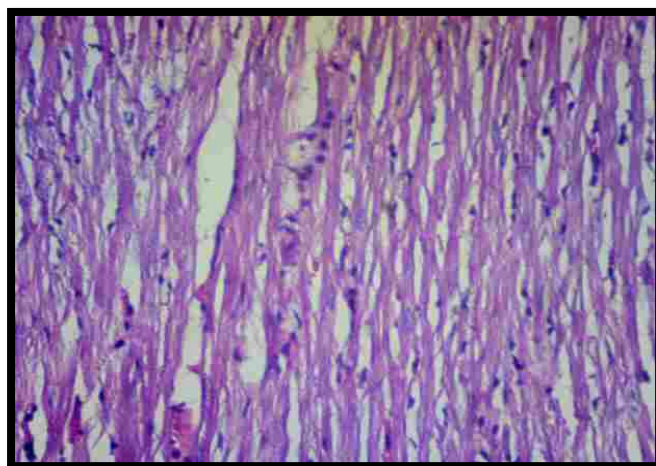
Kidney

Fig 5. Histopathology of group 5

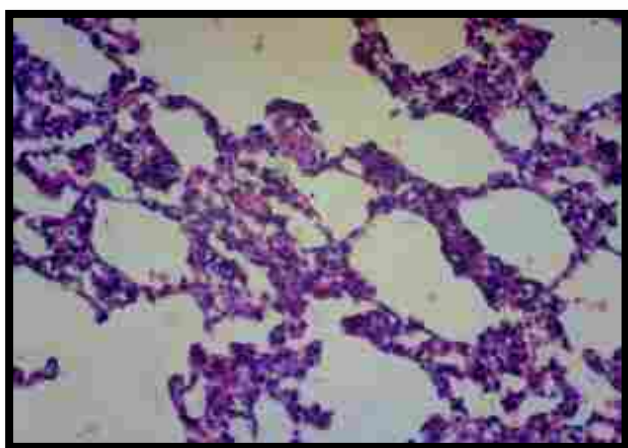
Group 6



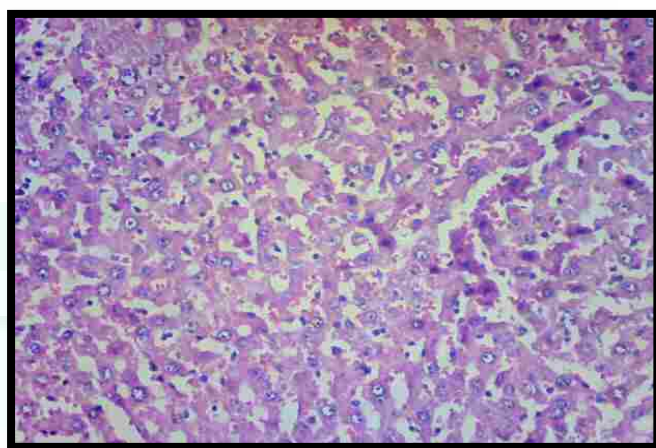
Brain



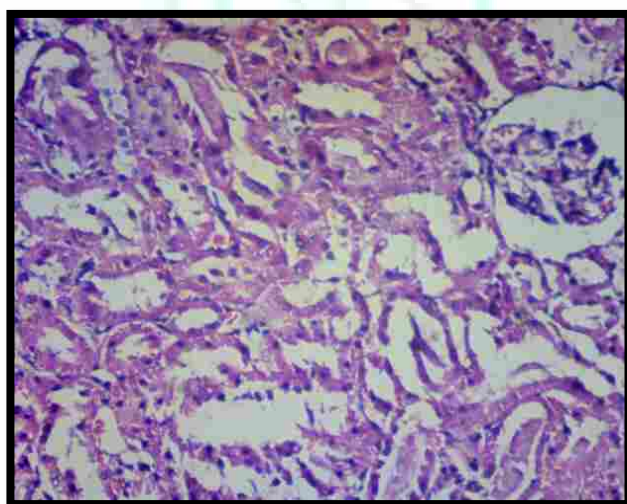
Heart



Lungs



Liver



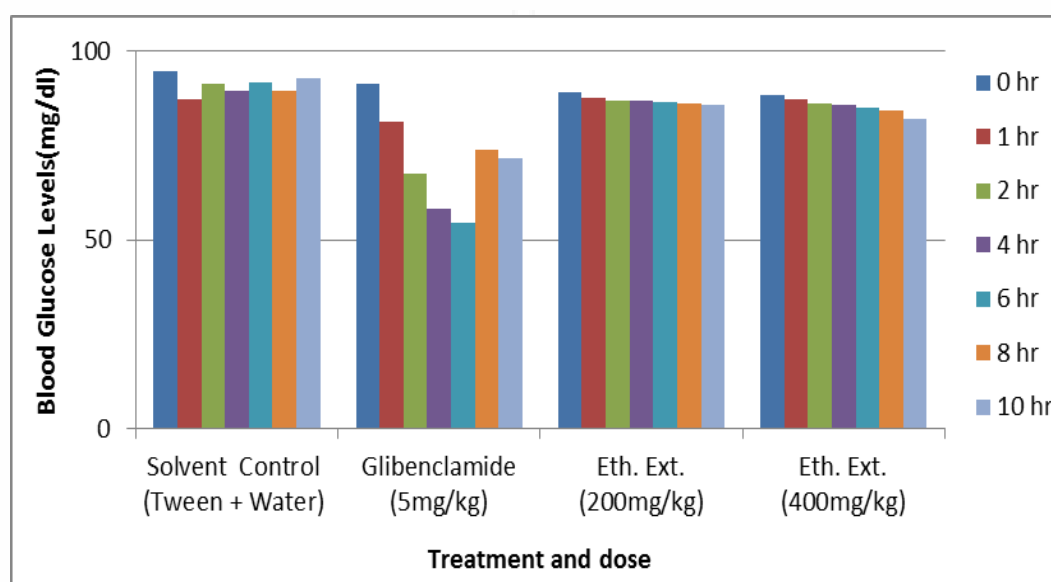
Kidney

Fig 6. Histopathology of group 6

Table 6. Effect of ethanolic extracts of *Scindapsus officinalis* Roxb. on oral glucose tolerance in normal rats

Gr.	Treatment and dose	Blood glucose concentration (mg/dl)					% decrease at end of 3hr
		0 min	30 min	60 min	120 min	180 min	
I	Normal Control	83.75 ± 0.47	86.50 ± 0.84	88.50 ± 1.56	83.50 ± 0.98	86.50 ± 1.47	--
II	Solvent control	90.50 ± 0.64	135.52 ± 0.64**	118.83 ± 0.85**	98.50 ± 0.61**	91.50 ± 0.24**	--
III	Glibenclamide (5mg/kg)	89.43 ± 0.40	95.50 ± 1.04**	81.53 ± 0.91**	72.50 ± 0.64**	62.51 ± 0.66**	30.10
IV	Eth. Ext. (200mg/kg)	83.62 ± 1.78	98.25 ± 0.85**	97.61 ± 1.91**	93.50 ± 1.63**	92.13 ± 0.95	6.22
V	Eth. Ext. (400mg/kg)	87.50 ± 0.89	107.31 ± 1.37**	102.32 ± 1.10**	94.50 ± 0.54*	91.50 ± 0.54	14.73

Values are expressed in MEAN ± S.E.M of six animals. One Way ANOVA followed by Dunnet's t-test (t-value denotes statistical significance at * $p < 0.05$, ** $p < 0.01$ respectively, in comparison to group-II)

Fig.7 Effect of ethanolic extracts of *Scindapsus officinalis* Roxb. on oral glucose tolerance in normal rats

Effect of the extracts on blood glucose level in streptozocine induce hyper glycemic rats (Acute and sub-acute models)

Acute model (In single dose treated streptozocin induced hyperglycemic rats)

The effects of ethanol and aqueous extracts on fasting blood glucose levels on single dose treated streptozocin induced diabetic rats are presented in table 5.11 The ethanol extracts at 200 mg/kg dose level registered 149.36, mg/dl at the end of 10 h of the study, while it was 132.59, mg/dl with dose

level of 400 mg/kg. However, at the same time the standard drug glibenclamide at 5mg/kg showed 98.59 mg/dl of BGL. A dose dependent effect of the test extracts was observed. The ethanol and aqueous extracts of *Scindapsus officinalis* Roxb. in both dose levels (200 and 400 mg/kg) showed a persistent decrease in blood glucose level till the end of 10 hr., while the standard drug glibenclamide showed a 66.65% decrease. The statistical significance of one way ANOVA showed significant reduction of BGL @ $p < 0.05$ to 0.01 starting from 1 hr up to the end of 10 hr within the groups. The potency order of the test extracts towards the falling of BGL is ethanolic extract.

Table 7. Effect of extracts of *Scindapsus officinalis* Roxb. on blood glucose level in single dose treated streptozocin induced hyperglycemic rats.

Group s	Treatment and dose	Blood Glucose Levels (mg/dl)							%age decrease at 10hrs
		0 hr	1 hr	2 hr	4 hr	6 hr	8 hr	10 hr	
I	Normal Control	93.09 ± 1.38	89.50 ± 0.64	88.50 ± 1.67	90.50 ± 1.78	87.59 ± 0.98	88.67 ± 2.14	89.76 ± 2.33	--
II	Diabetic Control (Tween + Water)	307.5 ± 4.34	297.63 ± 4.93**	301.81 ± 2.89**	291.88 ± 3.51**	287.89 ± 3.67**	303.77 ± 4.29**	279.61 ± 2.71**	--
III	Glibenclamide (5mg/kg)	295.7 ± 2.17	258.62 ± 3.21**	198.31 ± 2.49**	139.21 ± 2.63**	126.31 ± 3.28**	118.91 ± 2.96**	98.59 ± 2.87**	66.65
IV	Eth. Ext. (200mg/kg)	363.2 ± 3.98	348.38 ± 3.26	307.53 ± 3.24	240.79 ± 3.81**	211.44 ± 2.59**	163.53 ± 4.28**	149.36 ± 3.71**	58.87
V	Eth. Ext. (400mg/kg)	382.7 ± 4.15	369.68 ± 2.88	309.81 ± 2.36*	222.37 ± 3.77**	153.69 ± 3.91**	141.84 ± 3.28**	132.59 ± 2.93**	65.35

Effects of ethanolic fraction and hexane fractions of *Scindapsus officinalis* Roxb. on serum lipid profile

In streptozocin induced diabetic rats, the marked hyperglycemia is accompanied by hypercholesterolemia and hypertriglyceridemia. The table 5.19 illustrates the levels of serum lipid profile such as total cholesterol, total triglycerides, HDL, LDL, VLDL on 21st day of the study. The diabetic rats showed significant ($p < 0.01$) increase level of all tested lipid profiles except HDL, which showed decreased value in a significant ($p < 0.05$) extent.

The ethanolic fraction and hexane fractions at 150 mg/dl showed 143.79, 141.45 mg/dl total triglyceride level at the end of 21-day of the study, while at the same day the standard drug glibenclamide at 5mg/kg dose showed 135.02 mg/dl of total triglycerides. Similarly, by ethanolic fraction and hexane fractions at 150 mg/dl registered 58.99, 57.03 mg/dl and 61.20 mg/dl total cholesterol, while at the same day of study glibenclamide showed 51.55 mg/dl total cholesterol level.

Similarly the LDL level decreased to 24.98, 22.73 mg/dl and 25.08 mg/dl and VLDL level was decreased to 21.96, 20.93 mg/dl and 22.75 mg/dl by ethanolic fraction and hexane fractions while standard drug glibenclamide at 5mg/kg dose decreased 14.42 mg/dl, LDL level and 18.73 mg/dl, VLDL level. In diabetic rats the HDL level decreased, which was increased to 15.67, 16.33 mg/dl and 14.33 mg/dl by the ethanolic fraction and hexane fractions, while glibenclamide increase HDL level upto 19.05 mg/dl.

The decreased in TG, TC, LDL and VLDL level, while increased in HDL level by test extract and both fractions, in different test days showed a statistical significant of $p < 0.05$ to $p < 0.01$, while analyzed by using ANOVA followed by Dunnett's t-test. The extent of decrease lipid parameters except HDL of the 21-days treated rats were glibenclamide followed by ethanolic fraction and hexane fractions treated groups.

Table 8. Effect of ethanolic fraction and hexane fractions of *Scindapsus officinalis* Roxb. on serum lipid profile on treated streptozocin induced diabetic rats.

Groups	Treatments & Dose	TG (mg/dl)	TC (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)	HDL (mg/dl)
I	Solvent control (tween+ water)	90.22 ± 2.08	43.10 ± 2.64	9.46 ± 3.10	11.53 ± 0.30	22.00 ± 0.57
II	Diabetic control	231.33 ± 1.85	77.19 ± 1.20	36.19 ± 3.60	30.87 ± 0.58	8.33 ± 0.88
III	Glibenclamide (5mg/kg)	135.02 ± 3.71**	51.55 ± 6.50**	14.42 ± 3.74**	18.73 ± 1.60**	19.05 ± 0.57**
IV	Ethanolic fraction (150mg/kg)	143.79 ± 3.42**	58.99 ± 2.53*	24.98 ± 1.63*	21.96 ± 0.78*	15.67 ± 1.37**
V	hexane fraction (150 mg/kg)	141.45 ± 4.40**	57.03 ± 2.08*	22.73 ± 1.61*	20.93 ± 0.92*	16.33 ± 0.33**

Values are expressed in MEAN ± SEM of six animals. One Way ANOVA followed by Dunnett's t-test (t-value denotes statistical significance at * $p < 0.05$, ** $p < 0.01$ respectively, in comparison to diabetic control group).

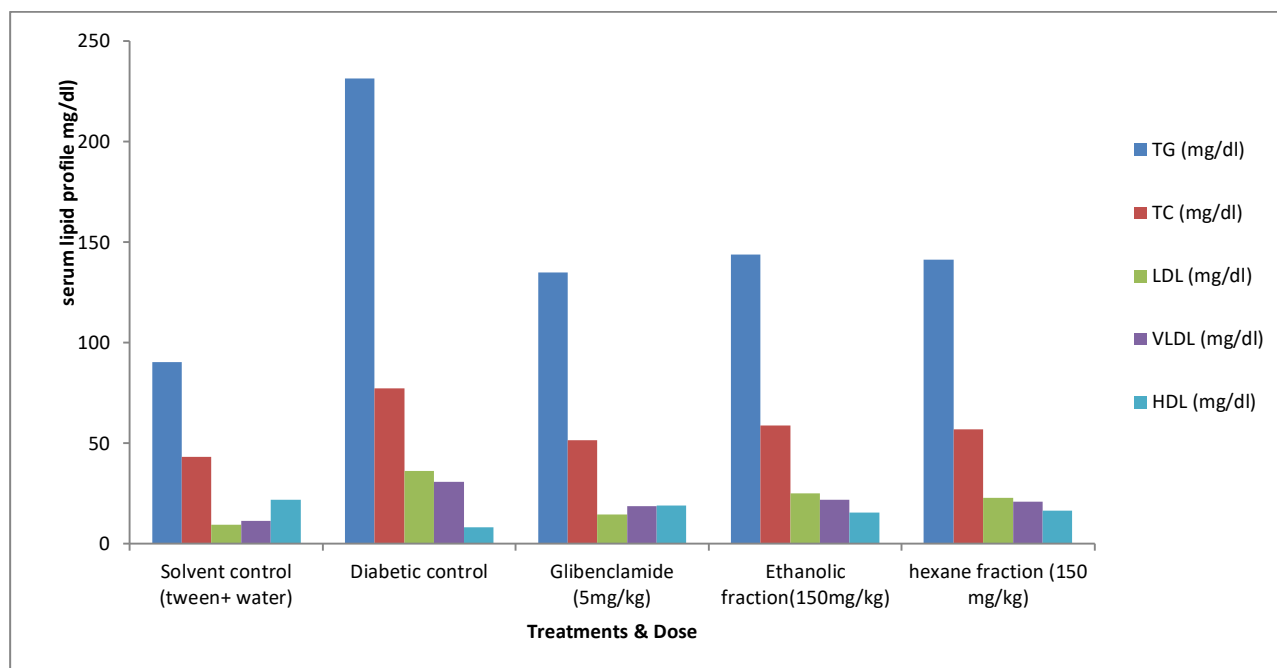


Fig.8 Effect of ethanolic fraction and hexane fractions of *Scindapsus officinalis* Roxb. on serum lipid profile on treated streptozocin induced diabetic rats.

CONCLUSION

Protocol for general procedures and use of animals for conducting this study in rat has been reviewed and approved by the Institutional Animal Ethics committee (IAEC vide protocol number 870/PO/Re/S/05/CPCSEA). Body weights will be recorded on the day 1 of acclimatization and on the day of randomization; on Day 1 (prior to dosing) and on Days 7 and 14 during the experimental period. Diabetes was induced in rats with an intraperitoneal injection of STZ ((40 mg/kg bwt) freshly prepared in 0.1 M sodium citrate buffer (PH 7) after overnight fasting. The rats exhibited diabetes after 5 days (i.e., fasting blood glucose concentration, >300 mg/dl) and were selected for the treatment with *Scindapsus officinalis*. Antihyperglycemic activity of ethanolic extracts in glucose-loaded animals (oral glucose tolerance test) performed as An oral glucose tolerance test (OGTT) was performed on diabetic rats by feeding glucose (5 g/kg) per os. The ethanol extracts at 200 mg/kg dose level registered 149.36, mg/dl at the end of 10 h of the study, while it was 132.59, mg/dl with dose level of 400 mg/kg. The ethanol extracts of *Scindapsus officinalis* Roxb. in both dose levels (200 and 400 mg/kg) showed a persistent decrease in blood glucose level till the end of 10 hr., while the standard drug glibenclamide showed a 66.65% decrease. The ethanolic fraction and hexane fractions at 150 mg/dl showed 143.79, 141.45 mg/dl total triglyceride level at the end of 21-day of the study, while at the same day the standard drug glibenclamide at 5mg/kg dose showed 135.02 mg/dl of total triglycerides. So above results and observed data concluded the fruits extract of *Scindapsus officinalis* possess the significant anti-diabetic and anti-hyperlipidemic activity.

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